BUILDING ELEMENT, CONNECTOR, FALL-ABSORBING BASE AND A KIT OF PARTS FOR CONSTRUCTING A PLAY APPARATUS

The invention relates to a building element for constructing a play apparatus, comprising a support element and at least two connectors connected to the support element for releasable coupling to other support elements. The invention also relates to a connector for use in such a building element. The invention further relates to a fall-absorbing base provided with at least one connector for coupling to such a building element. The invention further relates to an assembly of a fall-absorbing base and such a building element. In addition, the invention relates to a kit of parts for constructing a play apparatus, comprising at least one such building element.

Building elements for constructing a play apparatus are intended to enable children themselves to assemble a play apparatus. A play apparatus can for instance be a play-house, a climbing frame, slide or other play equipment. Usual construction systems have the drawback of being made from relatively hard and rigid materials which make it hazardous to fall thereon from more than about 60 cm. Such constructions have to be provided with extra safety precautions, such as railings and safety nets to prevent such a fall, with the consequence that in any case a few of the necessary intermediate steps in the building process cannot be safe. There is also the danger in usual construction systems of getting trapped between the hard and rigid components.

Modular construction systems are known wherein the building elements comprise a limited number of joins at added node-fixing means, for instance a sphere in which fixing means can be joined from different defined directions. The drawback of such a system is that the construction method is predefined, and that these extra node-fixing means are added.

The present invention has for its object to provide building elements with which a more flexible method of construction of play equipment by children is made possible.

The invention provides for this purpose a building element for constructing a play apparatus, comprising at least one support element and at least two connectors

connected to the support element for releasable coupling to other support elements, characterized in that the connectors can swivel relative to the support element.

Because the connectors are connected swivellably to the support elements, a plurality of building elements can be connected to each other in flexible manner. Many different configurations can hereby be envisaged using simple means, whereby the creative possibilities are increased compared to existing systems. The flexibility of the connectors further reduces the danger of getting trapped. The support elements of the building element serve to absorb the forces exerted on a play apparatus assembled from building elements. The support element can be manufactured for this purpose from a robust material, preferably a plastic. This provides sufficient strength to absorb forces, while it is still light enough in weight to be used by children. The support element preferably comprises support surfaces with which the support element can support on for instance a base or another support element. The forces are distributed with a support surface, whereby the play apparatus assembled from the building elements is relatively strong. It is advantageous if the support element comprises a recess, whereby the support element provides a better hold and it is simpler for a child to handle the building element. The recess can also be utilized as passage for children and as support position when climbing in a constructed play apparatus. The connectors can comprise diverse standard couplings, such as carbine hooks, eye hooks, fork hooks and harp shackles in diverse applications such as are known in, among others, the climbing and hoisting art and the rigging art. The connectors can be connected releasably to the support element. It is however recommended that the connectors are connected non-releasably to the support element. This has the advantage that the generally relatively small connectors cannot disappear through loss, theft or vandalism. The swivellable connection between the support element and the connector can be formed via diverse flexible connecting means, for instance a strap, a cable or elastic material. The invention relates to a flexible modular construction system with which for instance children can themselves build constructions of relatively large dimensions through play and using their own imagination. The invention includes modules which can be connected to each other at nodes by means of fixing means, wherein the fixing means are designed such that the number of modules for connecting per node is limited only by the accessibility of the node and the space available for the modules and fixing means around the node. In order to achieve this the fixing means are designed such that they have the possibility of

unlimited interconnection in random direction. This construction system is further distinguished from standard modular systems in that no additional fixing means are required at the nodes.

It is advantageous if the support element comprises a force conductor connecting the connectors. A force conductor can comprise for instance a rod, cable or tightening belt. The force conductor preferably also forms part of the connecting means with which the connectors are connected to the support element. A force conductor distributes the load forces via the connectors over the play apparatus erected from building elements, so that the load-bearing capacity of the apparatus is increased. The force conductor is preferably positioned substantially inside the support element. Forces on the outside of the support element are hereby decreased, thus reducing the risk of being trapped.

It is advantageous if at least on its surface the support element is substantially resilient. The surface of the support element can for instance comprise a resilient plastic, foam rubber, a cushion structure or an air cushion. The resilient material can extend over at least substantially the whole support element. It is advantageous if the support element takes an airtight form. The support element is hereby better able to withstand pressure and prevent buckling.

The building element preferably takes an inflatable form. An inflatable support element can be transported and stored in simple and space-saving manner in the non-inflated state. In the inflated state it can be used as float, so that a floating play apparatus can be assembled from a plurality of inflatable building elements. An inflatable support element is preferably provided with at least one valve for inflating and deflating. The inflatable support element is more preferably divided into a plurality of separately inflatable compartments, thereby increasing the safety and operational reliability of the support element.

In a preferred embodiment the support element is manufactured substantially by rotation moulding of plastic. Rotation moulding of plastic is a relatively inexpensive method of obtaining a hollow plastic body. It is also readily possible in this manner to give the support element an airtight form. A support body manufactured in such manner will have a low density and, if embodied watertightly, can also serve as floating element, so

that the possibilities of constructing play equipment with such building elements are extended to water play equipment such as rafts.

It is advantageous if the support element comprises at least one substantially elongate rib. An elongate rib is a form from which many possible shapes can be manufactured. In a preferred embodiment the connectors are fixed to at least two end surfaces of the rib. Such a rib provided with connectors on the outer ends provides the option of arranging many geometrical, aesthetically attractive shapes in a play apparatus. In preference the profile of the rib is substantially cylindrical in form. A cylindrical profile is simple to produce and can support in stable manner on a surface, for instance a support element of a second building element. In a cylindrical profile the pressure forces of an inflated support element are furthermore distributed optimally over the surface.

It is advantageous if the support element has a substantially flat geometrical form. Squares, pentagons, hexagons or octagons can for instance be envisaged here. The ribs of the geometrical form are preferably of equal length. Such flat geometrical forms generally fit together so that aesthetically attractive shapes can be applied in play equipment. It is also advantageous if the connectors are fixed substantially at the corner points of the geometrical form, thereby allowing the building elements to fit together at a plurality of points during construction, so that a more robust construction is created. It is recommended that the geometrical configuration is a triangle, preferably an equilateral or right-angled triangle. Both flat and three-dimensional constructions can be realized by coupling a plurality of triangles. Tetrahedron-like structures can for instance also be envisaged here. The triangle can also be a right-angled triangle, so that square shapes also become possible by coupling two such triangles. It is possible to assemble reliable and stable three-dimensional play equipment, such as a climbing frame, by firm coupling of a plurality of building elements at nodes where a plurality of connectors are mutually connected.

It is advantageous when the connectors are substantially uniform. This is understood to mean that all connectors are of the same form, so that any connector can be coupled to any other random connector. This results in great creative freedom during construction.

The invention also provides a connector for use in a building element according to the invention. In a preferred embodiment the connector comprises velcro tape. Velcro tape is a reliable coupling means with which reliable and simply releasable connections can be formed. In addition, a connector with velcro tape can readily be given a swivellable form, so that the building elements according to the invention can be embodied relatively inexpensively.

The connector is built up of a profile which is provided on the one end surface with a bayonet edge which is interrupted by bayonet edge openings and on the other side with one or more bayonet fingers corresponding therewith, so that successive connectors can be joined to each other head-to-head. In order to join the connectors to each other the bayonet fingers must be placed in the bayonet edge openings and the connectors rotated relative to each other so that the bayonet fingers hook behind the bayonet edge.

It can be further noted in respect of the bayonet fitting that it must consist of at least one, but preferably a plurality of bayonet fingers so as to be able to absorb the forces during joining and during the transmission of load in the joined position. If a plurality of bayonet fingers are applied, the number of coupling positions can be determined by the position of the bayonet fingers around the axis of rotation. In the case this is given a symmetrical form (for instance: in the case of two fingers 180 degrees relative to each other, in the case of three fingers 120 degrees relative to each other, and so on), the number of coupling positions equals the number of bayonet fingers. If the position is given an asymmetrical form, the number of coupling positions can be reduced to a single relative rotation position. The advantage of reducing the number of coupling positions is that the nodes are then less likely to become detached when the construction is loaded or deformed.

The form of the cross-section of the profile can in fact be freely chosen, but it is recommended to use for this purpose a round profile which is centred on the bayonet rotation, so that in the joined position the outer casings of the profiles connect together.

In order to connect the connector to the flexible part, the connector is provided, preferably along the outer casing of the profile, with fixing recesses to which a strap, cable, hook or other fixing means can be coupled. The position of the fixing eyes must

be chosen such that they do not obstruct the rotation of the connectors relative to each other, and must therefore lie within boundary surfaces of the bayonet edge and bayonet fingers. When the connectors are rotated relative to each other, the fixing eyes can then rotate past and over each other. The fixing recesses must provide the functional option of bringing about a connection between the connector and an external element, wherein this connection does not impede the rotation of two connectors relative to each other.

It is also possible to fix the flexible coupling part to the connector by means of glueing, fusing or in other manner, so that fixing eyes are not needed at all, although this has the drawback that this connection is not releasable. Reference will therefore be made hereinbelow to a connector with fixing options for external elements along the outer casing of the profile at a position and of dimensions such that the external elements do not obstruct the rotation of two joined connectors relative to each other.

The connector is preferably adapted for stackable coupling. An infinite number of connectors can in principle be mutually connected here. This can be achieved for instance in that a connector has both coupling means and counter-coupling means which can be coupled to the coupling means.

It is advantageous if the connector is provided with locking means. Locking means enhance the safety of the connection between the connectors.

In a preferred embodiment the connector is adapted for a bayonet coupling, preferably a rotation-asymmetrical bayonet coupling. In this case rotation-asymmetrical is understood to mean that the bayonet coupling to be formed has no rotation symmetry. Possible mirror symmetry is therefore not taken into account here. A bayonet coupling is easily realized and gives a connection with a high mechanical loadability. A bayonet coupling between two connectors can be formed such that the connectors remain rotatable relative to each other, so that a great flexibility in construction is achieved. A rotation-asymmetrical bayonet coupling is advantageous because it can only be disconnected in one relative rotation position, thereby minimizing the danger of undesired disconnection.

The invention further provides a fall-absorbing base provided with at least one connector for coupling to a building element according to the invention. Such a fall-absorbing base increases safety. Because the sequence in which the user will build the construction is not known beforehand, it is possible that an intermediate variant is not stable of itself and can tip over. In order to solve this problem this invention proposes that connecting points to the fixed world are arranged which must be taken as starting point and from which the construction must be assembled. In addition to its fall-breaking properties, the base also serves as anchoring point for a play apparatus to be constructed. The fall-absorbing base can for instance comprise a fall-breaking mat or an inflatable fall cushion. The fall-absorbing base can also be provided with anchoring means for connection to the fixed world. The fall-absorbing base can for instance be connected releasably to the fixed world by pegs. These connecting points are situated within the contours of a fall-absorbing mat which has dimensions such that it ensures sufficient lateral falling distance as measured from the outer connecting points. The fall-breaking base preferably comprises a peripheral zone free of connectors, wherein the peripheral zone has a width of at least 1 metre, preferably at least 2 metres, from the periphery of the fall-absorbing base. This has the purpose of enhancing safety in that constructed play equipment is assembled only at a safe distance inside the periphery of the fall-breaking base, so that children will always fall onto the fall-breaking base. The fall-absorbing base can consist of a plurality of fall-absorbing elements connected releasably to each other. This enables a compact storage and transport of the fall-absorbing base.

The invention also provides an assembly of a fall-absorbing base and a building element according to the invention. A play apparatus connected to a fall-absorbing base by means of connectors provides an enhanced stability and safety.

The invention further provides a play apparatus comprising at least one building element according to the invention. Such a play apparatus can be modified as required with great flexibility by means of connectors of the building element.

The invention further provides a kit of parts for constructing a play apparatus, comprising at least one building element according to the invention. It is possible here to envisage a construction kit in which a number of building elements and optional

accessories are included, for instance spare connectors. A fall-breaking base as described above can for instance also be included in such a construction kit. The present invention therefore comprises the entirety of the possible components, for instance modules, connectors and fall mats, in addition to the method for use of these components, i.e. beginning construction from one or more predefined fixed points, thereby making possible the highly imaginative and safe building and play that is intended.

The invention will now be elucidated with reference to several embodiments.

Figures 1-6 show several connectors for use in a building element according to the invention, and couplings which can be realized with these connectors.
Figure 7 shows an embodiment of a building element according to the invention.
Figures 8 and 9 show embodiments of play equipment constructed using building elements according to the invention.
Figures 10a, 10b, 11a and 11b and 12 show several usable connectors and the manner in which they can be stackably coupled.

Figure 1 shows a perspective top view of a connector 1for use in a building element according to the invention. Connector 1 is adapted for stackable coupling to another similar connector by means of a bayonet fitting. For this purpose connector 1 is provided with bayonet coupling means in the form of bayonet fingers 2 for engaging on a bayonet edge of counter-bayonet coupling means (see the following figures, for instance figure 2). Connector 1 is further provided with a recess 3 through which a tightening belt (not shown) can be fastened with which the connector 1 can be connected to a support element of a building element according to the invention. In order to lock the join of two or more connectors relative to each other and to provide additional coupling options between the connectors and external elements or the fixed world, the connectors can be provided on the inside, in axial direction relative to the profile, with one or more continuous holes. It is recommended here to opt for a single continuous hole centred relative to the rotation axis of the join, since it is then practically impossible for the fingers of the user to get caught on the inside of the connectors during joining and taking apart. To then lock the connectors, a shaft or fixing means can be placed through the stacked continuous holes and provided on the

outer ends with end stoppers, which prevent the possibility of the connectors being pulled apart.

Figure 2 shows a connector 4, comparable to connector 1 in figure 1, but now as seen from the underside. On the shown side the connector 4 is provided with counter-bayonet coupling means for co-action with bayonet coupling means, which in this case take the form of a bayonet edge 5 with bayonet edge openings 6 arranged therein. Bayonet edge openings 6 make it possible to carry corresponding bayonet fingers (for instance the bayonet fingers 2 of figure 1) under bayonet edge 5. A recess 7 for a connection option is also shown in this view. This recess 7 can otherwise also be replaced by recesses adapted for a connection to for instance a cord, cable or other connecting means instead of a strap.

Figure 3 shows how two connectors 8,9 are stackably coupled. Bayonet fingers 10 of the first connector 8 are placed by a movement along arrows A into the bayonet edge openings 11 of the second connector 9.

Figure 4 shows how the bayonet coupling is then realized by rotation of a first connector 12 relative to second connector 13, in that the bayonet fingers (not shown) of first connector 12 engage under the bayonet edge of second connector 13. The assembly of first connector 12 and second connector 13 retains the same functionality as a single connector in that the coupling options are available at top and bottom (see figures 1 and 2). Stackable coupling is hereby possible. An example of stackable coupling is shown in figure 5, wherein six connectors 14,15,16,17,18,19 are stackably coupled, and thus form a series connection which can in principle be continued infinitely. As each connector is fixed to a building element according to the invention, a plurality of building elements can in this way be coupled in a single node formed by the connectors, which offers many creative possibilities.

Figure 6 shows a connector 20 for a bayonet coupling, wherein the bayonet fingers 21 and bayonet edge openings 22 are placed asymmetrically. In this case asymmetrical is understood to mean that the bayonet coupling to be formed has no rotation-symmetry. This means that a bayonet coupling formed by two asymmetrical connectors 20 (compare for instance with figure 4) can only be uncoupled in one relative rotation

orientation, whereby the risk of undesired uncoupling is minimized. The shown asymmetrical connector 20 can be connected to a support element by means of a tightening belt through recess 23.

Figure 7 shows a building element 30 according to the invention, consisting of a triangular support element 31 provided at the corner points with three connectors 33 connected by means of cables 32. Support element 33 is manufactured from resilient plastic formed by rotation moulding into a hollow, watertight body. Cables 32 are incorporated in support element 33 as force conductor (indicated with broken lines 34), so that tensile forces on connectors 32 load the support element 33 as little as possible. Because support element 33 is substantially hollow or has at least an open cell structure, it remains light in weight and can therefore also be handled comfortably by children. Support element 33 can moreover take a watertight or at least water-repelling form, so that the building element can be used as float for a vessel or floating play apparatus. Support element 33 can optionally also be filled with a water-resistant plastic foam, so that the buoyancy is ensured in the case of damage. It is also conceivable to give the modules an inflatable form, so that they occupy little space during transport. The shape of the modules can in effect be freely chosen. It is however recommended from an economic viewpoint to opt for the fewest possible variants herefor. Particular attention is drawn here to the combination of equilateral triangles and right-angled triangles, wherein the node distances can be correspondingly chosen so as to make the number of possible couplings as large as possible. Making use of equilateral triangles it is possible to assemble, among other forms, regular polygons as known in mathematics, but also irregular figures and framework constructions. The number of construction variants becomes even greater with the combination of equilateral triangles and right-angled triangles. Some examples hereof are shown in the figures. Since the construction system is however per se unlimited, the figures should be deemed only as examples.

Because it is not known beforehand exactly how many users will take part in the building, and which tasks they will perform, unsafe situations can be envisaged wherein the fingers or arms of users become trapped between modules or fixing means. The invention comprises inter alia connectors which are safe for fingers and which preclude fingers being trapped during joining of the modules. In addition, it is proposed to use soft materials for the modules so as to prevent trapping of body parts. The modules can

consist for this purpose of inflatable material or of foam. If however the construction system is not applied as play apparatus, it is not necessary to comply with this requirement, and the modules can also consist of hard material. By filling the modules with a gas lighter than air, constructions which float in the air as well as in water can also be assembled.

Figure 8 shows an assembly 35 of a plurality of triangular building elements 36 (comparable to the building element of figure 7). Assembly 35 forms a floating play raft. A set of building elements 36 for building such a raft can be sold in a package, but also as separate elements. Building elements 36 are mutually connected at the adjoining corner points with connectors (not shown), wherein two connectors are connected at the first nodes 37 and three connectors are mutually connected at the second nodes 38. When connectors are used as shown in figures 1-6, the nodes are formed by a plurality of connectors coupled in stacked manner. The joined building elements can be used on the water as floating play apparatus. In such an application it is recommended to provide the modules with large continuous openings, so that in the case of an unlimited interconnection there is no danger of someone being trapped under the play apparatus or of the swimming distance under the apparatus becoming too great.

Figure 9 shows a fall-absorbing base 40 into which are anchored a plurality of connectors 41 to which can be coupled equilateral triangle-shaped building elements 42 and right-angled triangle-shaped building elements 43. The climbing frame 44 assembled from building elements 42,43 is anchored by connection to the fall-absorbing base 40. Connectors 41 are positioned at a distance away from the periphery 45 of fall-absorbing base 40 so that the risks of injury to a child falling off climbing frame 44 are limited. The wider the fall zone (the connector-free part of fall-absorbing base 40 as measured from periphery 45) is embodied, the higher a play apparatus 44 can be constructed without the risk of falling outside the fall-absorbing base becoming too great. It is the further intention of the invention that the users, and children in particular, can themselves build their own construction. Because children build a construction themselves, not only the final variant to be assembled, but all variants which necessarily occur during assembly, must be safe. In respect of the finished installation it is permitted to fall about 2 m onto a soft surface, for instance a fall-absorbing mat laid around the construction, whereby it is not unsafe to make a minor fall inside or outside

the construction, which has the consequence that intermediate steps in the building process are also safe.

Figure 10a shows a connector 50 made of plastic, provided with an engaging recess 51 and an engaging element 52 adapted to engage on an engaging recess 51 of another connector 50. Connector 50 is coupled to two flexible straps 53 for coupling to a support element (not shown) of a building element according to the invention. An engaging element 52 can be placed through engaging recess 51 of another connector 50 and the coupling is secured by rotation and mutual engagement. After coupling, the engaging element 52 of a first connector and the engaging recess 51 of the second element still remain available for a subsequent coupling, so that a plurality of connectors 50 can be stackably coupled in series.

Figure 10b shows how three connectors 55 (comparable to connector 50 of figure 10a) can be stackably coupled so that a node is created in which three building elements (not shown) are mutually connected. The forces within the assembled three-dimensional construction are distributed via flexible straps 56. The figure also shows that an additional flexible strap 57 joins two connectors 55, thus creating in effect a T-piece whereby the creative possibilities of the construction system are increased.

Figure 11a shows a connector 60 comprising a folding strip 61 provided on the surface with velcro tape 62, counter-velcro tape 63, and a ring 64. The whole of connector 60 is fastened to two flexible straps for connection to a support body (not shown) of a building element according to the invention. Folding strip 61 can be placed at least partially through a ring 64 of another connector 60, whereafter the folding strip is folded over and the connection is closed by the velcro tape. It is possible herein to connect a plurality of connectors together in series and thus form a node between a plurality of building elements according to the invention.

Figure 11b shows a stacked coupling of three connectors 65 according to the invention (comparable to connector 60 of figure 11a), with which a node is formed between three building elements according to the invention. Reliable and safe two-dimensional and three-dimensional play equipment can be assembled by forming a plurality of such nodes. Because the connectors are fastened to the support elements of the building

element with flexible straps, the building elements connected by means of the node can be placed in many relative orientations. Reliable and sturdy play equipment can however still be assembled by fixing the building elements at a plurality of points by means of at least two connectors.

Figure 12 shows two rotation-asymmetrical connectors 60, 61 adapted for a stackable bayonet coupling (see figures 1-6). Each connector 60,61 is provided with a fastening opening 62 for a cord (not shown). The rotation-asymmetrical bayonet edge 63 fits into the associated bayonet edge opening (on the other side of connector 60,61 not visible in the figure) in only one relative rotation position. Two such connectors 60,61 can hereby be coupled and uncoupled in only one relative rotation position. In all other relative rotation positions the forces on the formed bayonet coupling are distributed over substantially the whole bayonet edge opening as a result of the form of the bayonet edge.

Many other variants can be envisaged by a skilled person in the field in addition to the above non-limitative embodiments.